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(54) HUMIDIFIER WITH FLEXIBLE REMOVABLE DOOR

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HUMIDIFIER

Abstract of the Disclosure

A humidifier has three air passage openings in its housing, two of these being in opposite side walls. A movable water pick-up device, such as a belt or a rotating drum, is located in the housing and dips into a water reservoir therein. One of the two openings is sealed by a removable plug that is capable of sealing either of the two openings and which carries means such as a motor and speed reduction unit for driving the water pick-up device. There is a further opening in the housing which provides access to the interior of the housing for insertion and removal of the movable water pick-up device. This latter opening is closed by a removable door which has flanges that seat on flanges provided on the housing and tongues that are positioned behind portions of the housing, the door being flexible and being removable as a unit by flexing of the door sufficiently to move one of the tongues out of engagement with the housing.

Background of the Invention

This invention relates to humidifiers. More particularly, in a preferred embodiment this invention relates to furnace humidifiers, i.e., humidifiers adapted to be installed in association with a hot air furnace or in the ductwork of a hot air heating system. It should be understood, however, that in certain of its aspects this invention also is applicable to so-called portable, room humidifiers.

Humidifiers of the rotating drum or moving belt
10 type are well known. In such humidifiers open pore foamed polyurethane of the type sold under the trade mark SCOTFOAM commonly is used as the so-called evaporative media.

In rotating drum type humidifiers the foamed polyurethane is formed into the shape of a sleeve that fits over an open-sided cylindrical framework one end of which is closed. The lower part of the cylindrical framework dips into a water reservoir permitting the foamed polyurethane to pick up water. Air is blown into the open end of the cylindrical framework, passes through the foamed polyurethane
20 and evaporates water carried in the pores of the foamed polyurethane.

In moving belt type humidifiers a belt of foamed polyurethane is trained over rollers at least one of which is driven by an electric motor, for example. The moving belt is so arranged that its lower part dips into a water reservoir, and air is blown through the upper part of the belt evaporating water that has been picked up from the water reservoir.

Regardless of the type of humidifier which is employed, from time-to-time it is necessary to remove the
30 evaporative media to clean it or to replace it. In accordance with one aspect of this invention there is provided a humidifier having a housing provided with a unique access door permitting ready access to the evaporative media (and any



supporting components thereof) within the housing. The door is so arranged that it can be removed from several different positions, an important feature bearing in mind that furnace humidifiers often are installed in locations where ductwork or other obstructions may inhibit opening of an access door in all but one or two ways. The door also is constructed so that it is devoid of hinges and thus can be removed completely from the housing.

Regardless of the type of humidifier that is
10 employed, it should be sufficiently flexible in its design to permit it to be mounted on either side of the furnace. In accordance with another aspect of this invention there is provided a humidifier having openings in its housing in three different locations, two of the openings being on opposite sides of the housing. The openings are provided to permit air to pass into and out of the housing. In one of the latter two openings there is a removable plug that seals the opening and which supports the electric motor and gear reduction unit that drive the evaporative media via
20 its supporting framework or rollers. This plug can be placed in either of the latter two openings so as to permit air to pass into (or out of) either of the aforementioned sides of the housing.

In rotating drum humidifiers the foamed polyurethane often has been made into an annulus which is pulled over the supporting cylindrical framework. This is not a particularly advantageous way to instal or remove the foamed polyurethane. In accordance with another aspect of this invention the supporting cylindrical framework is provided
30 with upstanding picks that permit the evaporative media to be formed into a sheet and installed merely by wrapping it around the framework, stretching it slightly and impaling

it on the picks.

Summary of the Invention

In accordance with one aspect of this invention there is provided a humidifier comprising a housing having first and second openings therein for passage of air into the interior of said housing and out of said housing, means within said housing having water entrained therein, the latter means being so located and sufficiently porous to permit air that passes into and out of said housing to pass therethrough and pick up water therefrom, said housing having a third opening therein providing access to the interior of said housing for insertion and removal of said latter means, said third opening being closed by a removable door, said door having flanges that seat on flanges provided on said housing and tongues that are positioned behind portions of said housing, said door being flexible and being removable as a unit by flexing of said door sufficiently to move one of said tongues out of engagement with said housing.

Brief Description of the Drawings

This invention will become more apparent from the following detailed description, taken in conjunction with the appended drawings, in which:

Figure 1 is an exploded view illustrating a humidifier embodying this invention;

Figure 2 is a section taken along line 2-2 in
Figure 1;

Figure 3 is an end view of the end of the rotating
drum shown in Figure 1 in dotted outline;

Figure 4 is a section taken along line 4-4 in
Figure 1;

Figure 5 is a section taken along line 5-5 in
Figure 2;

10 Figure 6 is a view from the interior of the
humidifier housing looking towards the righthand side of the
humidifier housing in Figure 1; and

Figure 7 is a view similar to Figure 4 of another
embodiment of an aspect of the invention.

Detailed Description of the Invention
Including the Preferred Embodiments

Referring to the drawings, a humidifier embodying
the instant invention is designated in Figure 1 generally by
the reference numeral 10 and includes a housing 11 that has
a bottom wall 12, a rear wall 13, side walls 14 and 15, a
front wall 16 and a top wall 17. In the particular configura-
20 tion of the housing shown, which is not critical, rear wall
13 and side walls 14 and 15 extend upwardly at right angles
to bottom wall 12 with side walls 14 and 15 being parallel to
each other and perpendicular to rear wall 13. Front wall 16
extends forwardly and upwardly with respect to bottom wall
12 from the front edge thereof, while top wall 17 extends
forwardly from rear wall 13 at right angles thereto and at
right angles to side walls 14 and 15. Provided in rear wall
13 is a rectangular opening 18 which is defined by flanges 19
30 extending outwardly from back wall 13 at right angles with
respect thereto. Located in side walls 14 and 15 are circular
openings 20 and 21 respectively which are surrounded by annular

flanges 22 and 23 respectively that extend outwardly from the respective side walls 14 and 15 at right angles thereto. It will be noted from Figure 1 that side walls 14 and 15 are provided with flanges 24 and 25 respectively that project inwardly from the side walls at right angles thereto and which extend between front wall 16 and top wall 17. Housing 10 may be fabricated from any suitable material such as sheet metal, for example, and preferably is enameled or otherwise treated to render it corrosion resistant.

- 10 Access to the interior of housing 10 is provided by means of an access door 26 that preferably is formed of a transparent material to permit the interior of the humidifier and the components thereof to be seen. Any suitable plastics material may be employed. For example, LEXAN (trade mark) may be used. Door 26 is shaped somewhat in the configuration of a peaked roof having two sections 27 and 28 disposed at an obtuse angle with respect to each other. Depending from section 28 but formed integral therewith is a flange 29 that is disposed at an obtuse angle with respect to section 28.
- 20 It will be seen from Figure 1 that flanges 30 are located on the opposite side edges of door 26. However, flanges 30 do not extend the full length of these side edges and stop short of the bottom and top edges 31 and 32 of door 26, whereby door 26 is provided with lower and upper tongues 33 and 34 respectively.

Door 26 may be installed as shown in Figure 2. Referring to this Figure and the dotted line position of door 26, tongue 34 is inserted under the front edge of upper wall 17 and door 26 is closed in the direction indicated by arrow 35. The door is flexed slightly in order to permit tongue 33 to clear the upper edge of front wall 16, and

tongue 33 is inserted behind the upper part of front wall 16. Flanges 30 seat on flanges 24 and 25, the seating of flange 30 on flange 25 being shown in Figure 5. Door 26 may be removed by flexing it sufficiently to permit tongue 33 to clear the upper edge of front wall 16. Alternatively, door 26 may be installed or removed by inserting tongue 33 behind the upper part of front wall 16 and then flexing door 26 sufficiently to permit tongue 34 to be inserted under or withdrawn past the forward part of upper wall 17.

10 As best shown in Figures 1 and 6, extending across openings 20 and 21 are inclined channels 36 and 37, these channels inclining upwardly from adjacent rear wall 13 to flanges 24 and 25. Channels 36 and 37 also may be fabricated of sheet metal and are spot welded, riveted, bolted or otherwise secured to side walls 14 and 15 and to flanges 24 and 25. Secured to each channel is a bearing 38 that may be constructed of a suitable plastics material, for example. As shown in Figure 6, a movable stop 39 is located within each channel 36 and 37 to permit the location of bearings 38 to be adjusted, this being achieved by loosening the set screw 40, shifting stop 39 to the desired position along with bearing 38 and then tightening set screw 40.

Seated within housing 10 is a tray 41 that preferably is made of a plastics material. Tray 41 constitutes a water reservoir and is provided with an opening 42 (Figure 1) that communicates with an opening 43 (Figure 2) in lower wall 12. A removable plug 44 (Figure 2) is provided to close openings 42 and 43. Plug 44 may be removed when it is desired to drain the reservoir.

30 Mounted on the inside of side wall 15 is a float controlled valve 45, the float of which is shown at 46 and is located in the reservoir. Float controlled valves are well

known and need not be described in detail. Suffice it to say that float controlled valve 45 controls the flow of water into tray 41 maintaining it at the desired level.

The embodiment of the invention illustrated is a rotating drum type humidifier, but it is to be understood that it would be equally possible to practise certain aspects of the instant invention with a moving belt type humidifier or even with humidifiers employing other evaporative media such as wicks or porous plates. Thus the aspect of the 10 instant invention relating to providing access to the interior of the housing is not restricted to any particular type of evaporative media. Likewise, the aspect of the invention relating to the driving of a movable evaporative media is not restricted to a rotating drum type humidifier but could apply to a moving belt type humidifier. In any event, referring to Figure 1, there is shown a rotating drum 47 which can be constructed in any one of a number of different ways. In the particular embodiment illustrated drum 47 has two end plates 48 and 49, the latter being shown in Figure 3, 20 a shaft 50 interconnecting end plates 48 and 49 and secured thereto, shaft 50 being located on the longitudinal and rotary axis of drum 47, an open mesh cylindrical screen 51 extending between end plates 48 and 49 and a pad 52 of a suitable evaporative material, such as foamed polyurethane of the aforementioned type, for example, mounted on screen 51. It will be noted that end plate 48 is of spoked configuration and thus is open to permit air to flow into the interior of drum 47. End plate 49, on the other hand, is closed but is formed with a gear ^{53a} 53 on its exterior surface. A 30 End plates 48 and 49 may be made from any suitable plastics material, for example, while shaft 50 and screen 51 may be made from metal, for example, suitably treated to be corrosion

resistant. It will be seen from Figures 1 and 3, that shaft 50 projects beyond end plates 48 and 49. These projections of shaft 50 fit into channels 36 and 37, so that drum 47 may be readily installed merely by placing the projections of shaft 50 into the channels and letting drum 47 run down the channels until the projections of shaft 50 seat in bearings 38, as shown in Figure 6. Likewise drum 47 is readily removable from housing 10 simply by grasping the drum and moving it upwardly and forwardly in channels 36 and 37.

10 As best shown in Figure 4, but also shown in Figure 1, extending the length of screen 51 are a plurality of picks 53. In order to mount pad 52 of evaporative material on screen 51, one end of the pad is impaled on one set of picks. Pad 52 then is wrapped around the drum and slightly stretched before being impaled on the other set of picks. In this way pad 52 is firmly held on screen 51 but can be readily removed therefrom. It is to be understood, of course, that pad 52 is cut so that it is necessary to slightly stretch the pad to place it in position on screen 51.

20 In the embodiment shown in Figure 7 screen 51 is cut and formed so that picks 53 are part of the screen itself.

As shown in Figures 1 and 6, a removable plug 54 is provided to seal opening 21. Plug 54 has an annular flange 55 that telescopes snugly within flange 23 and an annular lip 56 that extends over flange 23. Flange 55 could telescope over flange 23 if desired. Mounted on plug 54 is an electric motor and gear reduction unit 57 that drives a gear 58 which meshes with gear ^{53a} ~~53~~ to drive drum 47. Plug 54 is held in position by means of screws 59. In the embodiment of the invention illustrated, plug 54 seals opening 21 and ducts are connected to flanges 19 and 22. Air passes into and out of the humidifier through these ducts. It will be assumed

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that opening 20 constitutes the inlet, while opening 18 constitutes the outlet, although these functions may be reversed. Thus, in the embodiment of the invention illustrated, an inlet duct 60 shown in dotted outlines is connected to flange 22. However, in accordance with an aspect of the instant invention, if it is desired for the inlet (or outlet) duct to be connected to flange 23, all that is necessary is for plug 54 to be employed to seal opening 20 rather than opening 21 and for drum 47 to be inserted into the housing with gear 53 adjacent channel 36 rather than adjacent channel 37. In this case flange 55 would telescope within flange 22. Consequently a humidifier embodying the instant invention is very flexible as far as installation is concerned.

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In the operation of the humidifier water is permitted to fill tray 41 to a predetermined level that is controlled by float controlled valve 45. Drum 47 is rotated and air is blown through opening 20 and end plate 48 into the interior of drum 47. The air passes through pad 52 picking up water that is entrained therein as a result of the pad passing through the water in tray 41. The moisture laden air exits from housing 10 via opening 18.

It is to be understood that while the instant invention has been described in connection with the use of foamed polyurethane as the evaporative material, this is not essential to the invention in any of its aspects. Many different types of evaporative materials are known and have been employed in the past.

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While preferred embodiments of this invention have been described and illustrated herein, those skilled in the art will appreciate that changes and modifications may be made therein without departing from the spirit and scope of this invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A humidifier comprising a housing having first and second openings therein for passage of air into the interior of said housing and out of said housing, means within said housing having water entrained therein, the latter means being so located and sufficiently porous to permit air that passes into and out of said housing to pass therethrough and pick up water therefrom, said housing having a third opening therein providing access to the interior of said housing for insertion and removal of said latter means, said third opening being closed by a removable door, said door having flanges that seat on flanges provided on said housing and tongues that are positioned behind portions of said housing, said door being flexible and being removable as a unit by flexing of said door sufficiently to move one of said tongues out of engagement with said housing.
2. A humidifier according to claim 1, wherein said door is transparent.
3. A humidifier according to either claim 1 or claim 2 wherein said door is made of a plastics material.
4. A humidifier according to claim 1 or claim 2 wherein said means within said housing having water entrained therein is a rotatable drum having an open end, a closed end and side walls through which air can pass and a pad of porous material mounted on said side walls.



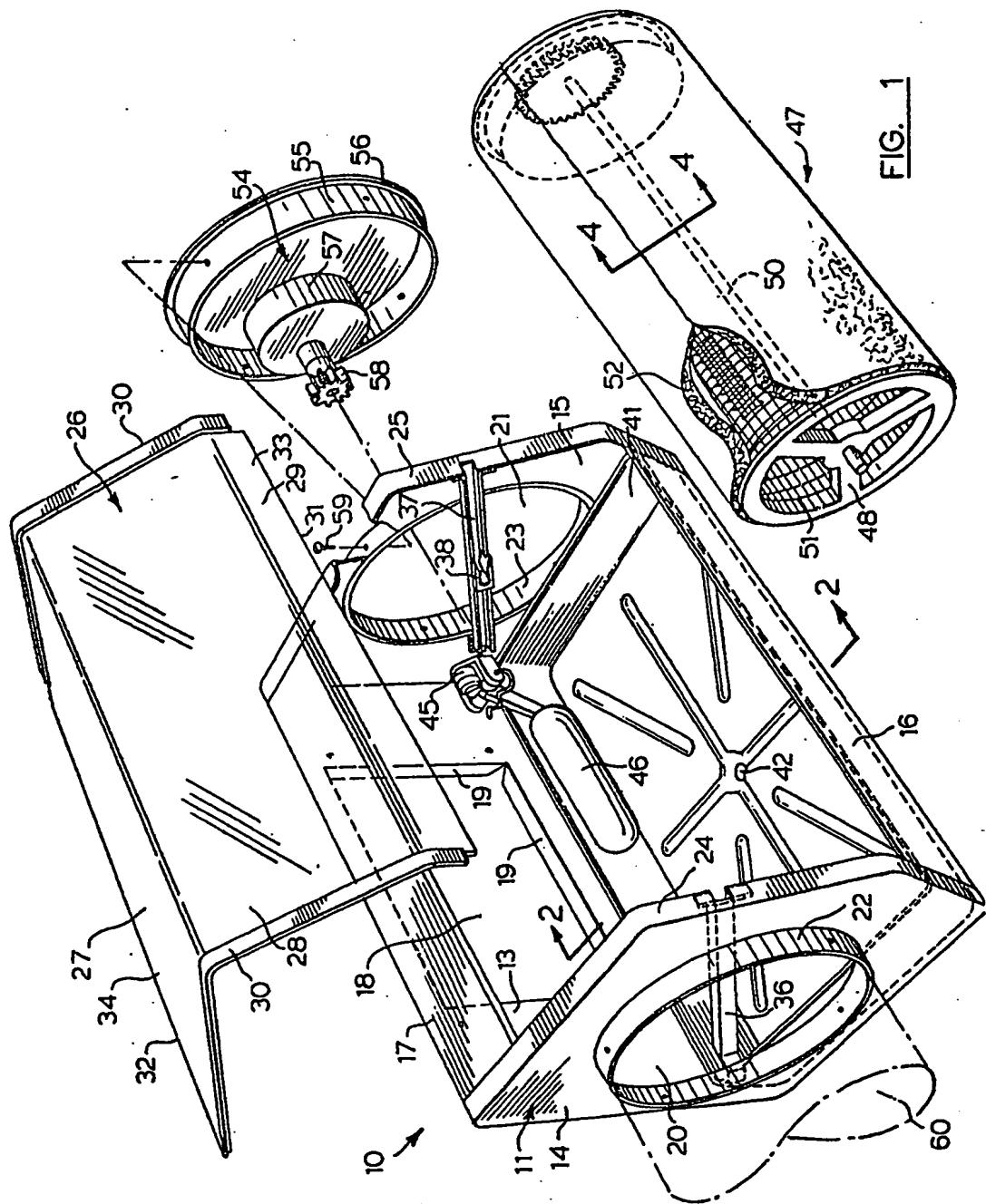
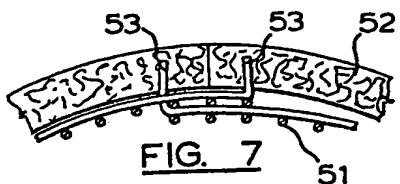
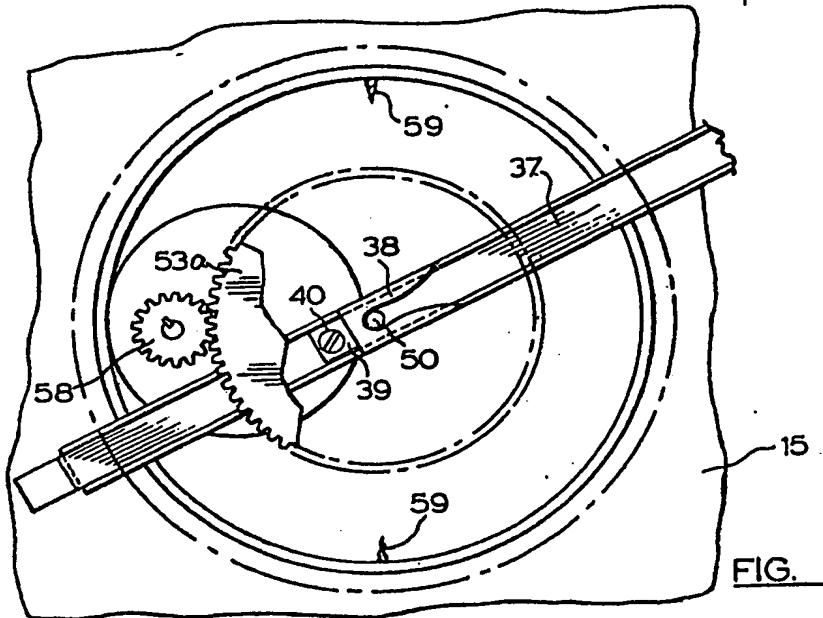
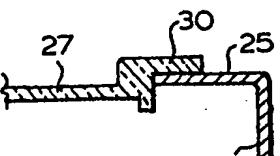
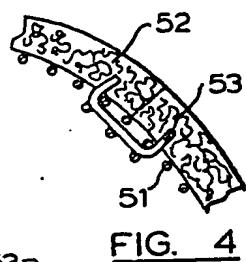
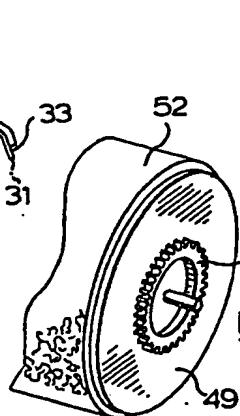
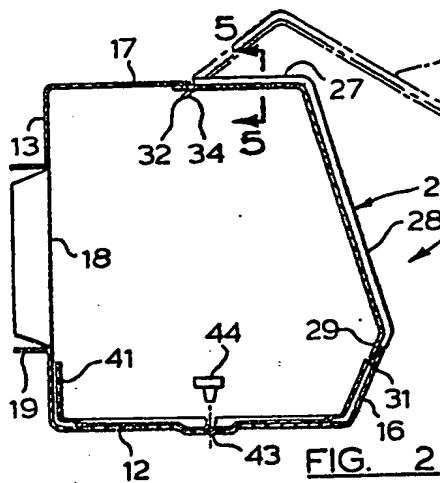


FIG. 1

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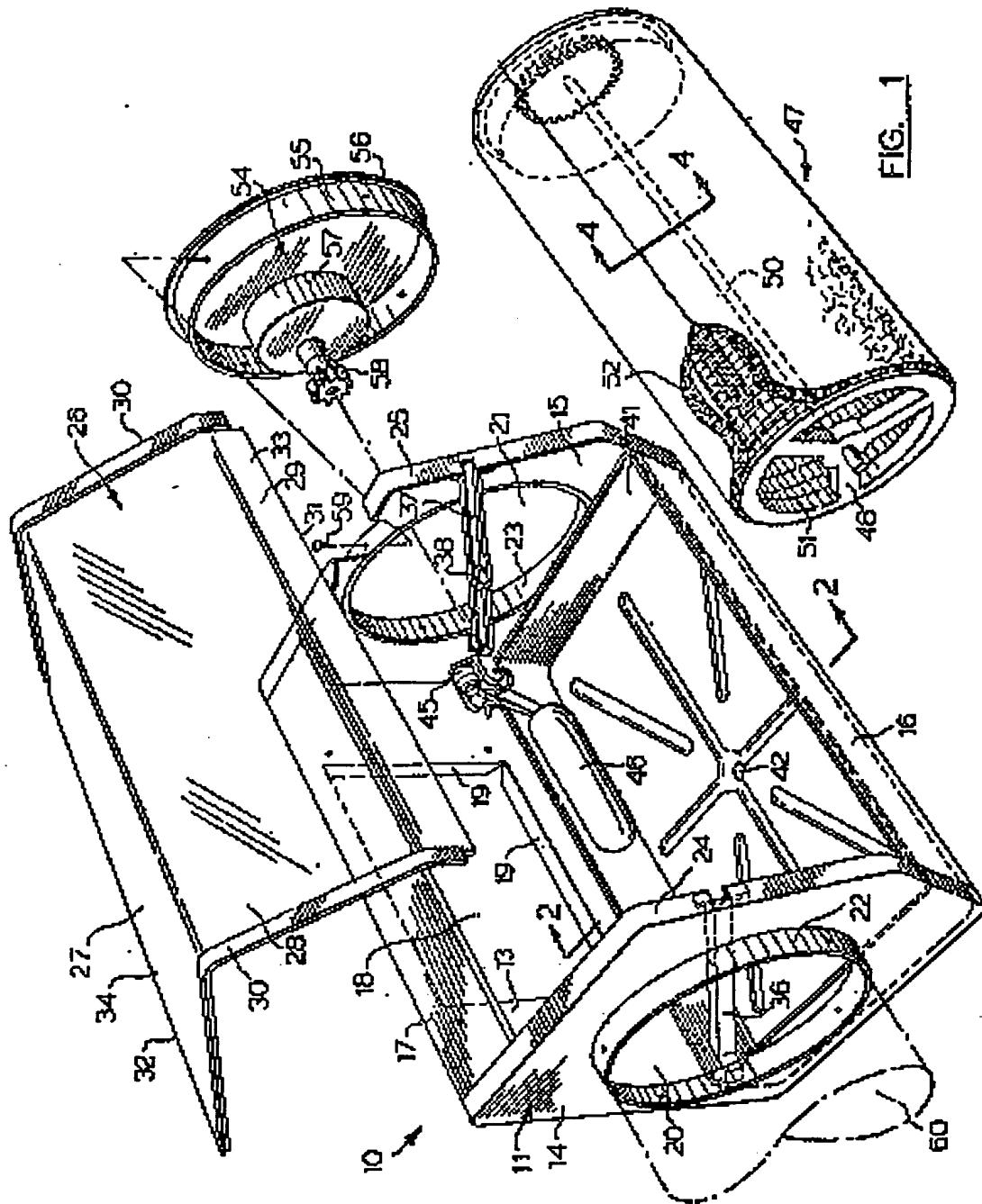
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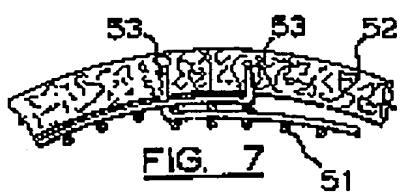
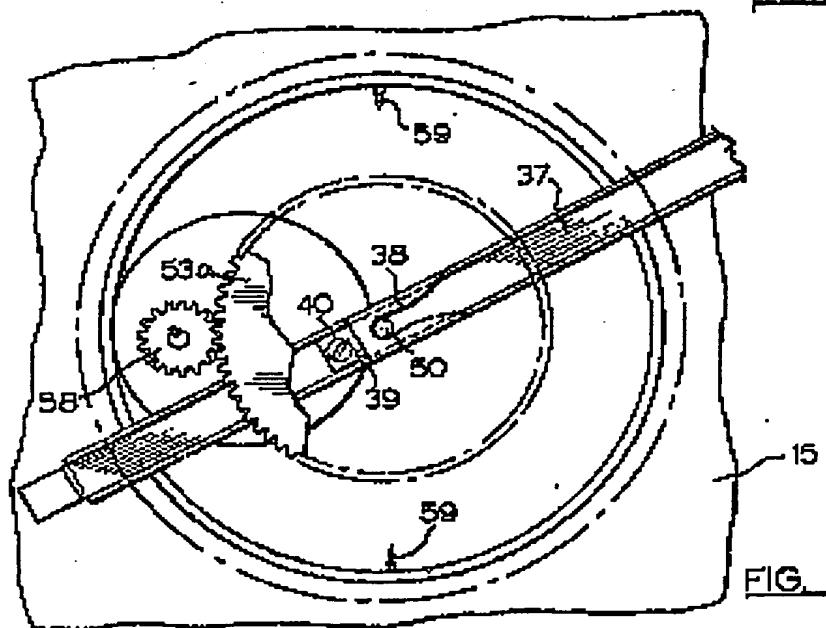
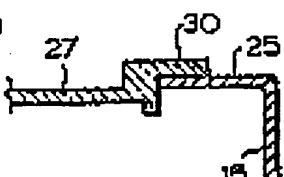
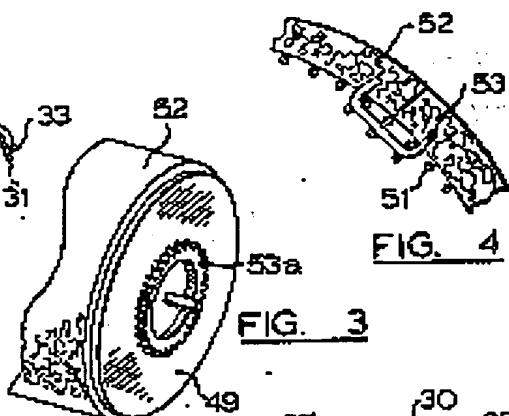
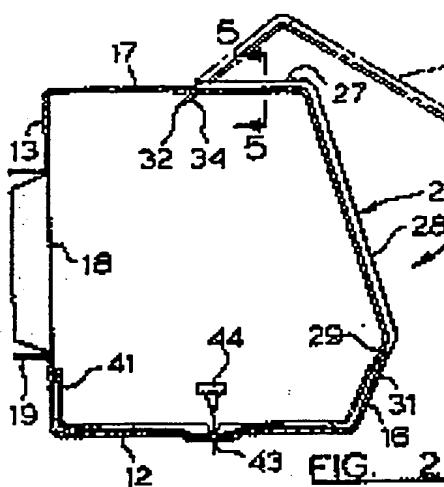
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